SOIL FEATURES
Griggs County, North Dakota

The following table gives estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A restrictive layer is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restrict roots or otherwise provide an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. Depth to top is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Potential for frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage to pavements and other rigid structures.

Risk of corrosion pertains to potential soil–induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle–size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as low, moderate, or high, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as low, moderate, or high. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

SOIL FEATURES--Continued
Griggs County, North Dakota

Map symbol and soil name	Restrictive layer				Potential for Frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated Steel	Concrete
		In	In				
61:							
Arveson	---	---	---	---	High	High	Low
118:							
Barnes	---	---	---	---	Moderate	Moderate	Low
Buse	---	---	---	---	Moderate	Moderate	Low
120:							
Buse	---	---	---	---	Moderate	Moderate	Low
Barnes	---	---	---	---	Moderate	Moderate	Low
156:							
Barnes	---	---	---	---	Moderate	Moderate	Low
Svea	---	---	---	---	Moderate	High	Low
167:							
Bearden	---	---	---	---	High	High	Low
296:							
Brantford	---	---	---	---	Low	Low	Low
314:							
Buse	---	---	---	---	Moderate	Moderate	Low
Barnes	---	---	---	---	Moderate	Moderate	Low
319:							
Buse	---	---	---	---	Moderate	Moderate	Low
Barnes	---	---	---	---	Moderate	Moderate	Low
391:							
Cresbard	---	---	---	---	Moderate	High	Moderate
Cavour	---	---	---	---	Moderate	High	Moderate
450:							
Colvin	---	---	---	---	High	High	Low
511:							
Divide	---	---	---	---	Moderate	High	Low
536:							
Zell	---	---	---	---	High	Low	Low
Eckman	---	---	---	---	High	Moderate	Low
539:							
Edgeley	20-40	Bedrock (paralithic)	---	Noncemented	Moderate	High	Low
541:							
Edgeley	20-40	Bedrock (paralithic)	---	Noncemented	Moderate	High	Low
569:							
Embden	---	---	---	---	Moderate	Moderate	Low
579:							
Embden	---	---	---	---	Moderate	Moderate	Low
Egeland	---	---	---	---	Moderate	Low	Low
595:							
Emrick	---	---	---	---	Moderate	High	Low
Cathay	---	---	---	---	Moderate	High	Moderate
597:							
Emrick	---	---	---	---	Moderate	High	Low
Heimdal	---	---	---	---	Moderate	High	Low
605:							
Esmond	---	---	---	---	Moderate	High	Low
Heimdal	---	---	---	---	Moderate	High	Low
753:							
Fram	---	---	---	---	High	High	Low
Wyard	---	---	---	---	High	High	Low
769:							
Gardena	---	---	---	---	High	Moderate	Low
773:							
Gardena	---	---	---	---	High	Moderate	Low
Eckman	---	---	---	---	High	Moderate	Low
881:							
Hamerly	---	---	---	---	High	High	Low
Tonka	---	---	---	---	High	High	Low
884:							
Hamerly	---	---	---	---	High	High	Low
Wyard	---	---	---	---	High	High	Low
893:							
Harriet	---	---	---	---	High	High	Moderate
988:							
Heimdal	---	---	---	---	Moderate	High	Low
Emrick	---	---	---	---	Moderate	High	Low

SOIL FEATURES--Continued
Griggs County, North Dakota

Map symbol and soil name	Restrictive layer				Potential for Frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated Steel	Concrete
		In	In				
998:							
Heimdal	---	---	---	---	Moderate	High	Low
Esmond	---	---	---	---	Moderate	High	Low
1001:							
Esmond	---	---	---	---	Moderate	High	Low
Heimdal	---	---	---	---	Moderate	High	Low
1015:							
Kensal	---	---	---	---	High	High	Low
1062:							
Ladelle	---	---	---	---	High	High	Low
1108:							
Larson	---	---	---	---	Moderate	High	Moderate
Cathay	---	---	---	---	Moderate	High	Moderate
1188:							
Ludden, NONSALINE	---	---	---	---	High	High	Low
1189:							
Ludden, SALINE	---	---	---	---	High	High	Moderate
1221:							
Maddock	---	---	---	---	Low	Low	Low
Hecla	---	---	---	---	Moderate	Low	Low
1267:							
Marysland	---	---	---	---	High	High	Low
1268:							
Marysland	---	---	---	---	High	High	Low
1427:							
Parnell	---	---	---	---	High	High	Low
1454:							
Wyndmere	---	---	---	---	High	High	Low
1466:							
Pits, Sand And Gravel	---	---	---	---	None	Low	Low
1710:							
Southam	---	---	---	---	High	High	Low
1762:							
Svea	---	---	---	---	Moderate	High	Low
Barnes	---	---	---	---	Moderate	Moderate	Low
1765:							
Svea	---	---	---	---	Moderate	High	Low
Buse	---	---	---	---	Moderate	Moderate	Low
1766:							
Buse	---	---	---	---	Moderate	Moderate	Low
Svea	---	---	---	---	Moderate	High	Low
1769:							
Cresbard	---	---	---	---	Moderate	High	Moderate
Svea	---	---	---	---	Moderate	High	Low
1781:							
Swenoda	---	---	---	---	Moderate	High	Low
1843:							
Towner	---	---	---	---	Moderate	High	Low
1883:							
Parnell	---	---	---	---	High	High	Low
Vallers	---	---	---	---	High	High	Low
1886:							
Hamerly	---	---	---	---	High	High	Moderate
Vallers	---	---	---	---	High	High	Moderate
1970:							
Walum	---	---	---	---	Low	High	Low
1978:							
Water	---	---	---	---	---	---	---
2118:							
Fram	---	---	---	---	High	High	Low
Tonka	---	---	---	---	High	High	Low
2121:							
Ferney	---	---	---	---	Moderate	High	Moderate
2151:							
Binford	---	---	---	---	Low	Low	Low
Coe	---	---	---	---	Low	Low	Low

SOIL FEATURES--Continued
Griggs County, North Dakota

Map symbol and soil name	Restrictive layer				Potential for Frost action	Risk of corrosion	
	Kind	Depth to top	Thickness	Hardness		Uncoated Steel	Concrete
		In	In				
2152:							
Coe	---	---	---	---	Low	Low	Low
Binford	---	---	---	---	Low	Low	Low
2153:							
Edgeley	20-40	Bedrock (paralithic)	---	---	Moderate	High	Low
Kloten	9-20	Bedrock (paralithic)	---	---	Moderate	High	Low
Esmond	---	---	---	---	Moderate	High	Low
2156:							
Lamoure	---	---	---	---	High	High	Moderate
Rauville	---	---	---	---	High	High	Moderate
2157:							
Maddock	---	---	---	---	Low	Low	Low
Esmond	---	---	---	---	Moderate	High	Low
Embden	---	---	---	---	Moderate	High	Low
2158:							
Velva	---	---	---	---	Moderate	High	Low
2159:							
Walsh	---	---	---	---	Moderate	High	Low
2196:							
Colvin, SALINE	---	---	---	---	High	High	Moderate
Bearden, SALINE	---	---	---	---	High	High	Moderate
2197:							
Edgeley	20-40	Bedrock (paralithic)	---	Noncemented	Moderate	High	Low
Kloten	9-20	Bedrock (paralithic)	---	Noncemented	Moderate	High	Low
2198:							
Hamar	---	---	---	---	Moderate	High	Low
Hecla	---	---	---	---	Moderate	Low	Low
2199:							
Hamerly, VERY STONY	---	---	---	---	High	High	Low
Barnes, VERY STONY	---	---	---	---	Moderate	High	Low
Tonka, VERY STONY	---	---	---	---	High	High	Low
2200:							
Letcher	---	---	---	---	Moderate	High	Moderate
Swenoda	---	---	---	---	Moderate	High	Low
2201:							
Stirum	---	---	---	---	Moderate	High	Moderate
Arveson, SALINE	---	---	---	---	High	High	Low
2202:							
Swenoda	---	---	---	---	Moderate	High	Low
Barnes	---	---	---	---	Moderate	High	Low
2203:							
Swenoda	---	---	---	---	Moderate	High	Low
Barnes	---	---	---	---	Moderate	High	Low
2204:							
Walsh	---	---	---	---	Moderate	High	Low
2205:							
Zell	---	---	---	---	High	Low	Low
Eckman	---	---	---	---	High	Moderate	Low